

sounding motion, and the dependence of the qualities of the tone on the nature of the motion. A rapidly-rotated shaft has an adjustable eccentric with jointed rod, which at each rotation pulls a large drum-skin to and fro. A bell-mouth strengthens and concentrates the tones. The velocity of rotation determines the pitch; the eccentricity the strength of the tones. The *phonomotor* acts on the opposite principle, rotatory motion being got from vibration. In the *electromagnetophone* a piece of sheet-iron under an electromagnet has a point dipping in mercury; a current passing through the coils and the point becomes readily intermittent, and the membrane sounds. The *electromagnetic membrane-siren* is similar, but a solid sliding contact takes the place of the mercury, and a driving-wheel gives rapid interruption. Again, a tuning-fork is supported so as to be capable of rotation before a resonance-case. According to position it gives a strong resonance or a weak interference tone, the latter slightly higher. On rotating, the former becomes lower, the latter higher, and the dissonance ever greater. A *resonance-interference-pipe* is formed by connecting a caoutchouc tube with the nodes of an open pipe. If the tube be shortened by pressure at different parts, the tone of the pipe is raised or lowered through resonance-interference, is extinguished, or lets only the first overtone be heard. These instruments are made by G. F. Weigle, in Stuttgart.

CONTINUING his researches on "adsorption," or condensation of gases on surfaces of solids, Herr Kayser (*Wied. Ann.* No. 4) has studied the influence of the adsorbing material. The pressure was determined, which occurred in the glass vessel when given volumes of gas had been in contact with the solid material. The gases were carbonic acid, sulphurous acid, and ammonia, and these were adsorbed in the empty glass vessel, by coarse glass powder, and by turnings of brass and wrought iron. The metal-turnings were quite clean and unoxidised, and before each experiment they were heated *in vacuo* to about 300°, to remove gas. It was found that pressure was greatest, and so adsorption least, in the empty vessel. The order of increasing adsorption was, in general: empty vessel, iron, brass, and glass powder. By the empty vessel, SO₂ was least condensed, CO₂ and NH₃ about equally. Also, on the metallic surfaces, SO₂ always gave greater pressure than NH₃; between CO₂ and SO₂ there was hardly any difference. By the glass surfaces, on the other hand, CO₂ was comparatively little condensed, NH₃ considerably, and SO₂ to a large extent.

THE behaviour of mercury when polarised in contact with dilute sulphuric acid (as in Lippmann's well-known experiments), and with other acids and salt solutions, has been studied by Herr König at the instance of Prof. Helmholtz (*Wied. Ann.*, No. 5). The surface-tension, it is shown, reaches a maximum at a mean state of polarisation different for different liquids; the values diminishing on either side, as one removes from this, and both with positive and negative charges. Prof. Helmholtz offers some comments by way of theory on the phenomena.

FROM experiments at Würzburg (*Wied. Ann.*, No. 5), Mr. William Hallock infers the correctness of the view that the changes of electromotive force of the Smee element are due to action of polarisation. The electromotive force of polarisation is by no means independent (he affirms) of the nature of the electrodes, and it considerably exceeds that necessary for visible decomposition. The polarisation cannot be calculated from the heat phenomena.

To find whether the two coefficients used in equations of motion of incompressible liquids—one of viscosity, the other of variable adherence of the liquid to the walls—are independent of velocity, M. Elie (*Journ. de Phys.*, May) rotates a solid sphere within another filled with liquid, and hung bifilarly. The smaller sphere (0.04 m. diameter) is supported by a metallic wire passing through an aperture in the larger (0.12 m.) between the suspending wires to the vertical axis of an electric rotatory apparatus. During rotation (2 to 10 turns in a second) the hollow sphere is displaced to an amount indicated by a reflected light spot, and stops when the moment of the bifilar suspension balances that due to friction. In all the experiments with water, the reactions due to friction were found to increase more rapidly than the velocity; the ratio increased a third when the velocity was doubled; hence it appears that the viscosity or adherence, or both together, increase with the velocity.

THE name of *rheolysier* has been given by Prof. Wartmann to an apparatus (described in the *Archives des Sciences* for May)

whereby the intensity of a derived electric current may be rapidly varied from zero to a maximum, and which indicates exactly the relation of those variations. A graduated metallic ring round a tripod-supported column encloses a thick disc of glass or ebonite, resting on the six radii of the ring. In the upper surface of the disc is a circular trough of mercury receiving two copper electrodes at the bottom, at a semicircle of interval. A cross-bar on the top of the column, on which it turns as axis, acts as a movable Wheatstone-bridge; it has two terminal verniers, and two screws dipping in the mercury; these latter are insulated, but communicate, through central binding screws, with a mirror galvanometer. The intensity of the derived current varies according as the bridge is displaced.

GEOGRAPHICAL NOTES

THE last work by Dr. E. Regel, on the Flora of Central Asia, which has recently appeared in the "Acta Horti Petropolitani" (vol. vii.), gives to Prof. Rehring, of Berlin, the opportunity of discussing the relations between the present flora and fauna of the North-eastern Asiatic Steppes, and the Post-glacial flora and fauna of Middle Europe. Prof. Regel, on the ground of his researches in Asia, arrived at the conclusion that out of the species which inhabited Central Asia during post-glacial times, very few have migrated towards north-western Asia and to Europe, and that the species now inhabiting this part of Asia have probably immigrated from Europe. The same was the conclusion arrived at several years ago by Dr. Rehring, when he and Dr. Liebe discovered in the Diluvium of Germany (at Westregeln and at Gera), a steppe-fauna much akin to the West Siberian (*Dipus jaculus*, *Arctomys bobac*, *Spermophilus altaicus*, *Logomys pusillus*, *Equus caballus*, &c.), which facts led him to the inference that in post-glacial times middle Germany enjoyed a steppe vegetation and climate. The same steppe fauna has since been discovered at many other places in Germany, so that it may be said that the German diluvium encloses an unmistakable steppe fauna. Dr. Rehring discovers in Dr. Regel's work new proofs in favour of his theory of migration of the diluvial fauna from Europe to Asia, in opposition to the theory of the late Dr. Brandt, who considered North-western Asia as the true fatherland of the European diluvial fauna. We may observe that Dr. Rehring's theory would imply the migration of the German steppe fauna, not only to North-western Siberia, but also to Eastern Siberia, during the post-glacial period, which would involve several important difficulties. We believe that a true theory of the migrations of post-glacial faunas can be established only by taking into account the history of the glacial period in Asia, which history has never investigated.

DISCUSSING the character of the Glacial period on the Caucasus, M. Moushketoff points out (*Izvestia*, vol. xviii, fasc. 2), those features which are common to the former glaciers of the Caucasus, and those of the Zerafshan in Central Asia. He observes the present comparatively small extent of glaciers and snow-fields in both countries. The area now covered with perpetual snow on the Caucasus is very small (250 square kilometres) compared with the extent of the same regions in the Alps (more than 3000 square kilometres). The same relations—M. Moushketoff says—must have existed to some extent between both countries during the Glacial period, because of the greater dryness of climate on the Caucasus, and still more in Central Asia, in comparison with Western Europe. He concludes, in accordance with M. Abich and many others, that the ancient glaciers of the Caucasus had a far greater extension than the present ones (for instance, those of the Elbrouz reached, at least, down to 5200 feet, and the Baskan glacier united into one single mass all the present small glaciers which do not now descend lower than 6600 to 8600 feet). Nevertheless the glaciation was not so general as in Western Europe. This conclusion only must be provisional, the traces of the Glacial period having not yet been the subject of a thorough exploration, either on Caucasus or in Turkestan, whilst the obliteration of these traces has been far more complete in both these countries than in Europe. Taken in its widest sense, the supposition that the glaciation has been less intense in Middle Asia than in Europe seems very probable, and has been arrived at also by other explorers of Turkestan and Siberia.

BESIDES the Annual Address of the President, Lord Aberdare, reviewing the geographical progress of the year, the June number of the *Proceedings* of the Royal Geographical Society contains Mr. O'Donovan's paper on Merv; M. de Gorloff's account of

his journey in the Atlas and the Northern part of the Algerian Sahara; the Rev. Thos. Wakefield's fourth journey to the Southern Galla country; and Capt. Paiva de Andrada's Zambesi Expedition, 1881. We learn that the Search Expedition for Mr. Leigh Smith is now organised, and will be commanded by Sir Allen Young. The expedition will leave this month.

FROM a letter of Consul H. E. O'Neill in the June number of the Geographical Society's *Proceedings*, it would seem that the "snow-clad Irati" spoken of by Messrs. Maples and Goldfinch as reported to exist in the country south-east of Lake Nyassa, is probably a delusion. Mr. O'Neill was close to the mountain, which he estimates at not more than between 5000 to 6000 feet above the sea.

MISS ELLEN M. TAYLOR has compiled a very useful guide-book to Madeira, under the title of "Madeira: its Scenery, and How to See It" (Stanford). She gives the very kind of information intending visitors are likely to want, and the possession of which will save them much trouble. While Miss Taylor draws largely on existing authorities, she also gives the results of her own experience. Her list of trees, flowers, ferns, and seaweeds will be useful to the amateur naturalist.

THE first paper in the June number of *Petermann's Mittheilungen* is on M. Charnay's expedition to the ruins in Central America, by Herr Fred. Kofler. Dr. Hermann J. Klein has an article of much interest on "Some Volcanic Formations in the Moon," in which he suggests that the lunar surface ought to be carefully examined by geologists, in order to discover the exact condition of things as compared with terrestrial geology. There is a short account of Oschanin's exploration of Karategin in 1878, and a very useful paper by Herr B. Hassenstein, on the geographical and cartographical literature of the Indo-Chinese border-lands, with a map of the Tibetan and Indo-Chinese border-region.

THE last number of the *Izvestia* of the Russian Geographical Society (vol. xviii. fasc 2), contains a good many valuable papers. We notice among them the preliminary report on the geological exploration of the former beds of the Amu-daria, by A. E. Hedroitz; a paper by M. Mousketoff on his geological exploration of the Caucasus; a description of an excursion to Seraks, by P. M. Lessar, with a map of the route between Askabad and Seraks; a notice by A. Regel of his journey to the Karategin and Darvaz, dated Ka'a-i-Khumb, with a map; on the sands of Ferghana, by M. W. Malakhoff, and a variety of small notices. We are glad to learn that the *Izvestia* will have a special department, "Polar News," devoted to all that concerns the exploration of Polar regions; it will be under the direction of Baron Wrangel.

WE learn from the *Izvestia* of the Russian Geographical Society that Dr. A. E. Regel has returned from his journey to Karategin and Darvaz to Samarkand, and is preparing for a new journey to the Pamir.

PROF. NORDENSKJÖLD has telegraphed to the Mayors of Tromsø, Hammerfest, and Vardö, on behalf of Herr Oscar Dickson, of Gothenburg, asking them to acquaint skippers leaving for the Arctic Sea, with the rewards offered by Herr Dickson for the Discovery of the *Eira*, viz. 225*l.* to be paid to the one who may first relieve Mr. Leigh Smith or any of his companions; 140*l.* to the one who may first discover and give information in writing of the crew of the *Eira*, of a later date than November 1 last, 50*l.* for the first information, by telegraph, addressed to Herr Oscar Dickson, that any one of the crew of the *Eira* has been found, or a letter from either of a later date than that of November 1 last.

THE German Antarctic expedition, consisting of Dr. Schrader and six companions, have sailed by the Hamburg mail steamer for Monte Video, thence by Imperial corvette to the island of South Georgia, to establish a scientific station for meteorological observations. They will remain twelve months.

AT the last meeting (May 30) of the Russian Geographical Society, the Secretary said that a telegram received from Irkutsk announces the possibility of establishing seven new meteorological stations in the far north, namely, at Verkhojansk, Orlensk, Witimsk, Olekminsk, Kirensk, Nokhtuisk, and Preobrajensk, besides the station already established at the mouth of the Lena. The necessary instruments will be forwarded immediately by the Central Meteorological Observatory. At the same meeting, M.

Rykatcheff made a communication on tides in the atmosphere. He proved the correctness of the theory of Laplace with regard to atmospherical tides by the discussion of a very great number of anemometrical observations.

PROF. LENSTROM, Secretary of the Meteorological Commission of the Society of Science in Finland, anxious that Finland may participate in the Circumpolar observations, has offered to erect a station at Sodankylä (67° 20' N., 26° 40' E.), which proposition has been accepted by the President of the International Congress, Dr. H. Wild, of St. Petersburg.

THE ROYAL OBSERVATORY

THE annual visitation of the Royal Observatory took place on Saturday, when the Astronomer-Royal, Mr. W. H. M. Christie, presented his report.

"The Report," Mr. Christie states, "here presented, refers to the period of twelve months, ending May 20, 1882, a fixed date being taken, conveniently near to the visitation day. Sir G. B. Airy resigned his office on August 15, 1880, and a portion of the observations here referred to were made under his superintendence. There seems to be no occasion to separate these from the remainder, as the course of observation which Sir G. B. Airy has carried out for so many years has been continued without essential alteration in its main features."

Of the Transit of Venus instruments the Report states, two transits, three altazimuths, five 6-inch equatorials, two photoheliograph mountings, nine clocks, and one Transit of Venus model have been sent to Mr. Stone at Oxford for use in the forthcoming Transit of Venus, and three transits, an altazimuth, a photoheliograph, and two clocks are at the Cape of Good Hope, where they will be available for the Transit of Venus.

A series of pendulum observations was made in the record room last autumn by Major Herschel, R.E.

After giving details as to the usual astronomical observations, the altazimuth, and other matters, Mr. Christie goes on to speak of the spectroscopic and photographic observations:—

"During the twelve months ending May 20, 1882, the sun's chromosphere has been examined with the half-prism spectro-scope on 36 days, and on every occasion prominences were seen. On one day a detailed examination of the whole spectrum of the chromosphere was made at 24 points on the sun's limb. Several prominences have shown great changes in the course of two or three minutes, and large displacements or contortions of the bright lines, indicating very rapid motions of approach or recession have been noted. In particular, a prominence examined on May 13, 1882, was observed to rise through a space of about 30' in less than two minutes, being at the rate of about 110 miles a second, whilst the C line showed a displacement towards the red gradually increasing from $1\frac{1}{4}$ to $11\frac{1}{4}$ tenth metres, corresponding to a motion of recession increasing in two minutes from 36 to 330 miles a second. Thirteen sun-spots have been examined on 20 days with reference to the broadening of the lines in their spectra. The strong black lines or bands in the part of the spectrum between δ and F, first noticed in the spectrum of a spot on November 27, 1880, have been generally observed to be present in the spectra of spots during the last twelve months, besides several fine lines in the same region of the spectrum to which there is nothing corresponding in the solar spectrum. For the determination of motions of stars in the line of sight, 177 measures have been made of the displacement of the F line in the spectra of 41 stars, 68 of the δ_1 line in 19 stars, and 9 of the δ_2 line in 5 stars. Of the 61 stars observed, 15 had not previously been examined, and the total number of stars of which the motions have been spectroscopically determined, is now 106. In the case of three of the stars observed in the last year, a dispersive power equivalent to that given by sixteen prisms of 60° has been used. A comparison of the successive determinations of the motion of Sirius indicates a progressive diminution from about 22 miles a second in 1877 and 1878, to about 7 miles a second or less this year, and as other stars do not show anything similar, it appears likely that the change is due to the orbital motion of Sirius. Further observations will, however, be required to settle the point. The spectrum of Comet δ 1881, was examined on six nights, that of Comet ϵ 1881, on three nights, and that of Comet α 1882, on three nights. The spectra of the first two objects showed the usual cometary bands corresponding to those of the first spectrum of carbon, and a continuous spectrum from the nucleus and brighter portions of the head. Comet